AMENDMENTS TO THE CLAIMS

1-20. (Canceled)

21. (Currently amended) A sensing device for sensing a specific binding between an analyte and a recognition molecule, the sensing device comprising:

a patterned, localized, and individually addressable microelectronic sensor, the sensor comprising an individually addressable activation element and a plurality of self-aligned recognition molecules covalently bound to a sensor surface comprising an anchoring layer, wherein the activation element is a thermal activation element configured to adjust a temperature of a part of the anchoring layer and the anchoring layer's immediate surroundings by heating or cooling or is an electrochemical activation element configured to adjust an oxidation state of a part of the anchoring layer through a locally applied voltage or current, wherein the part of the anchoring layer has an area of less than 1 mm^2, wherein a volume of part of the anchoring layer's immediate surroundings, measured as extending into a space accessible by the recognition molecules, is less than 1 mm^3, and wherein the sensor is configured to ~~electrically detect or electrically sense~~ electrochemically detect a specific binding between the recognition molecules and an analyte.

22. (Previously presented) The sensing device of claim 21, wherein the sensing device is a field effect transistor.

23. (Previously presented) The sensing device of claim 21, comprising a plurality of micro-electronically individually addressable sensor surfaces, wherein each sensor surface is individually activatable.

24. (Previously presented) The sensing device of claim 21, comprising a plurality of patterned, localized, and individually addressable microelectronic sensors.

25. (Canceled)

26. (Previously presented) The sensing device of claim 21, wherein the anchoring layer is selected from the group consisting of chemical molecules and a metal layer.

27. (Previously presented) The sensing device of claim 21, wherein the anchoring layer is activatable by electrochemical actuation.

28. (Previously presented) The sensing device of claim 21, wherein the activation element is an electrochemical activation element.

29. (Previously presented) The sensing device of claim 28, wherein the sensor surface comprises a surface layer, the surface layer comprising a material configured to allow electron transfer over the surface layer.

30. (Previously presented) The sensing device of claim 29, wherein the material is selected from the group consisting of a metal, a thin oxide, a semiconductor, an organic layer, and combinations thereof.

31. (Previously presented) The sensing device of claim 21, wherein the activation element is a thermal activation element.

32. (Previously presented) The sensing device of claim 21, wherein the thermal activation element is selected from the group consisting of a resistor, a microwave heatable element, and a peltier element.

33-40. (Canceled)

41. (Previously presented) The sensing device of claim 21, wherein the device is a microelectronic chip.

42-49. (Canceled)

50. (Previously presented) A method for detecting an analyte, comprising:

providing a sensing device according to claim 21~~, the sensing device comprising a patterned, localized, and individually addressable microelectronic sensor, the sensor comprising an individually addressable activation element and a plurality of self-aligned recognition molecules covalently bound to a sensor surface comprising an anchoring layer, wherein the activation element is a thermal activation element configured to adjust a temperature of a part of the anchoring layer and the anchoring layer's immediate surroundings by heating or cooling or is an electrochemical activation element configured to adjust an oxidation state of a part of the anchoring layer through a locally applied voltage or current, wherein the part of the anchoring layer has an area of less than 1 mm^2, wherein a volume of the part of the anchoring layer's immediate surroundings, measured as extending into a space accessible by the recognition molecules, is less than 1 mm^3, and wherein the sensor is configured to electrically detect or electrically sense a specific binding between the recognition molecules and an analyte~~; and

~~electrically~~ electrochemically detecting a binding event between the recognition molecule and an analyte, wherein detection of the binding event is indicative of a presence of the analyte.

51. (New) The sensing device of claim 21, wherein the sensing device comprises a field effect transistor attached upside down to a solid substrate by a bottom auxiliary layer.

52. (New) The sensing device of claim 51, further comprising nano-wells or micro-wells created on a surface of the device and configured to confine heat flow for a duration of the binding event that occurs between the self-aligned recognition molecules and the anchoring layer.

52. (New) The sensing device of claim 51, wherein the anchoring layer is immobilized directly onto a backside of the field effect transistor.

53. (New) The sensing device of claim 51, wherein the anchoring layer is immobilized on a top auxiliary layer atop a backside of the field effect transistor.

54. (New) The sensing device of claim 53, wherein the top auxiliary layer is a dielectric layer having a thickness of less than 10 nm, whereby electrical access to the anchoring layer by tunneling is permitted.

55. (New) The sensing device of claim 53, wherein the top auxiliary layer is a metal layer.

56. (New) The sensing device of claim 51, further comprising at least one deposition control structure comprising a temperature control element selected from the group consisting of Joule dissipative heaters and peltier elements, and at least one deposition control structure configured to control an oxidation state of electroactive moieties in the anchoring layer and selected from the group consisting of switched microelectrodes and non-switched microelectrodes.

57. (New) The sensing device of claim 56, further comprising a local temperature sensor configured to monitor a heating/cooling process and to provide control feedback for applied thermal power.

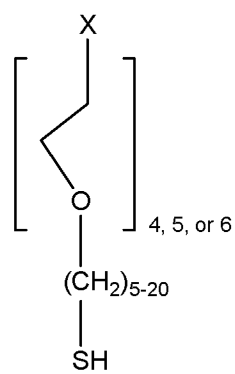
58. (New) The sensing device of claim 56, wherein the auxiliary bottom layer is configured to thermally isolate the temperature control element from the solid substrate and to assist in heat transfer towards the anchoring layer, and wherein the auxiliary bottom layer comprises at least one material selected from the group consisting of an oxide, an oxynitride, and a polymer.

59. (New) The sensing device of claim 56, wherein the auxiliary bottom layer is configured to electrically isolate the microelectrode from the solid substrate.

60. (New) The sensing device of claim 21, wherein the sensing device comprises a ion sensitive field effect transistor fabricated on a solid substrate.

61. (New) The sensing device of claim 60, wherein the anchoring layer is immobilized on a Ta_2O_5 auxiliary top layer atop the ion sensitive field effect transistor.

62. (New) The sensing device of claim 21, wherein the self-aligned recognition molecules are of a formula:



wherein X is OH, OCH_3, or hydroquinone.